



Indiana Department of Environmental Management

Office of Water Quality

Wetlands Section

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February 4, 2011

Closing Date:
February 24, 2011

IDEM ID Number:
2010-599-49-BCB-A

Corps of Engineers ID Number:
LRL-2010-1196-sam

PUBLIC NOTICE

To all interested parties: This letter shall serve as a formal notice of the receipt of an application for **Section 401 Water Quality Certification** by the Indiana Department of Environmental Management (IDEM). The purpose of the notice is to inform the public of active applications submitted for water quality certification under Section 401 of the Clean Water Act (33 U.S.C. § 1341) and to solicit comments and information on any impacts to water quality related to the proposed project. IDEM will evaluate whether the project complies with Indiana's water quality standards as set forth at 327 IAC 2.

1. Applicant: Mr. Eric Strickland
Kite Realty Group
30 South Meridian Street, Suite 1100
Indianapolis, IN 46204

2. Agent: Ms. Sarah Wright
Christopher B. Burke Engineering, Ltd.
115 West Washington Street, Suite 1368 S
Indianapolis, IN 46204

3. Project location: Section 20, Township 17 North, Range 4 East, Fishers U.S.G.S. Quad, Marion County.

4. Affected waterbody: 0.12 acre of a 0.328 acre federally jurisdictional forested wetland, Upper White 8 – Digit Hydrologic Unit Code, 05120201.

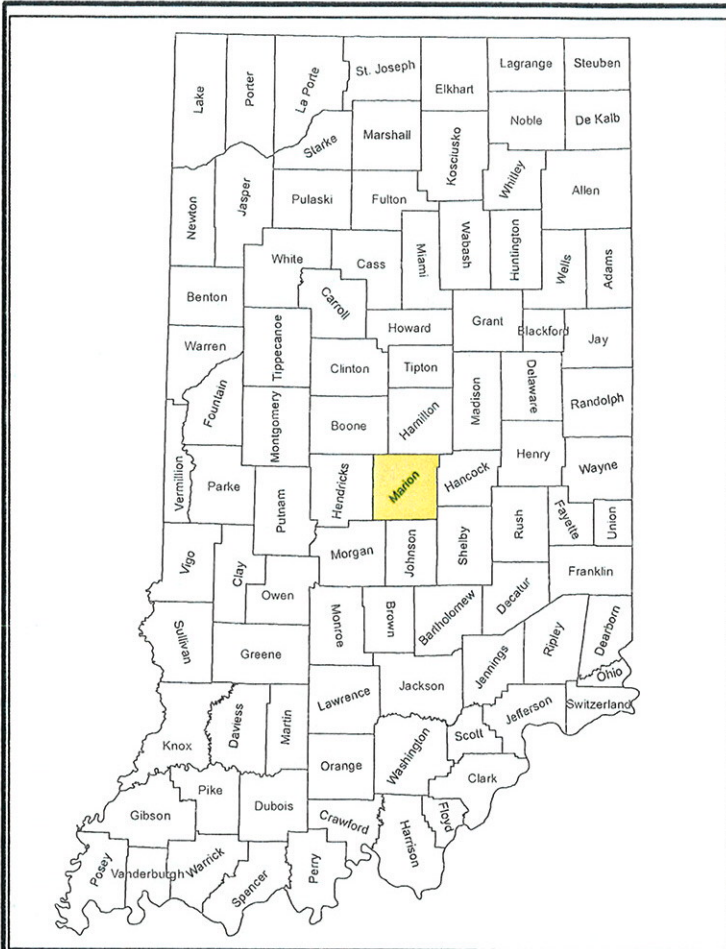
5. Project Description: The applicant proposes to fill 0.12 acre of a 0.328 acre federally jurisdictional forested wetland with clean earthen fill. The purpose of the project is to expand the existing retail center by constructing a new building for the growing demands of the Bicycle Garage Indy. To mitigate for the 0.12 acre forested wetland fill, the applicant proposes to enhance and preserve a 26 acre property which contains approximately 16 acres of forested wetland located directly north of the proposed development. This site will be donated to the Indianapolis Parks Department, and protected in perpetuity. For additional plans and information, please visit the IDEM Public Notice website at the following link: <http://www.in.gov/idem/6399.htm>

Comment period: Any person or entity who wishes to submit comments or information relevant to the aforementioned project may do so by the closing date noted above. Only comments or information related to water quality or potential impacts of the project on water quality can be considered by IDEM in the water quality certification review process.

Public Hearing: Any person may submit a written request that a public hearing be held to consider issues related to water quality in connection with the project detailed in this notice. The request for a hearing should be submitted within the comment period to be considered timely. The request should also state the reason for the public hearing as specifically as possible to assist IDEM in determining whether a public hearing is warranted.

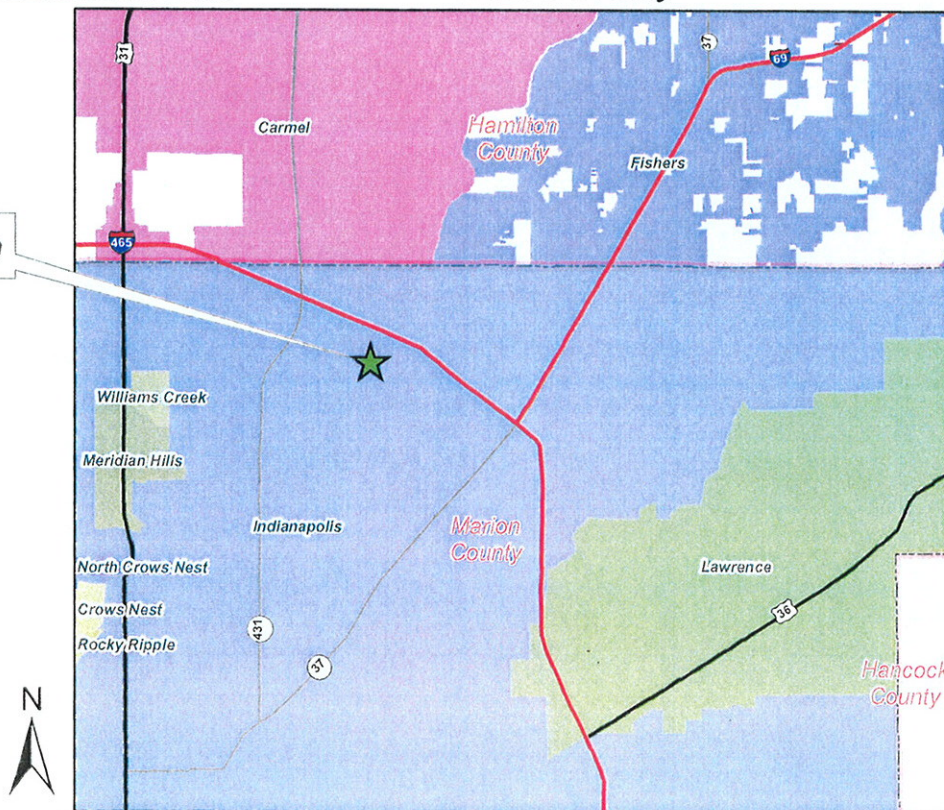
Questions? Additional information may be obtained from Mr. Brad Baldwin, Project Manager, at 317-234-5647. Please address all correspondence to the project manager and reference the IDEM project identification number listed on this notice. Indicate if you wish to receive a copy of IDEM's final decision. Written comments and inquiries may be forwarded to -

Indiana Department of Environmental Management
100 North Senate Avenue
MC65-42 WQS IGCN 1255
Indianapolis, Indiana 46204-2251
FAX: 317/232-8406



Marion County

Project Location



Christopher B. Burke Engineering, Ltd.
 National City Center, Suite 1368 South
 115 West Washington Street
 Indianapolis, Indiana 46204
 (t) 317.266.8000 (f) 317.632.3306

PROJECT:	Kite Realty Wetland Assessment	PROJECT NO. 10-0103	APPROX. SCALE n.t.s.
TITLE:	Site Location Map		DATE: 03/10
			EXHIBIT 1



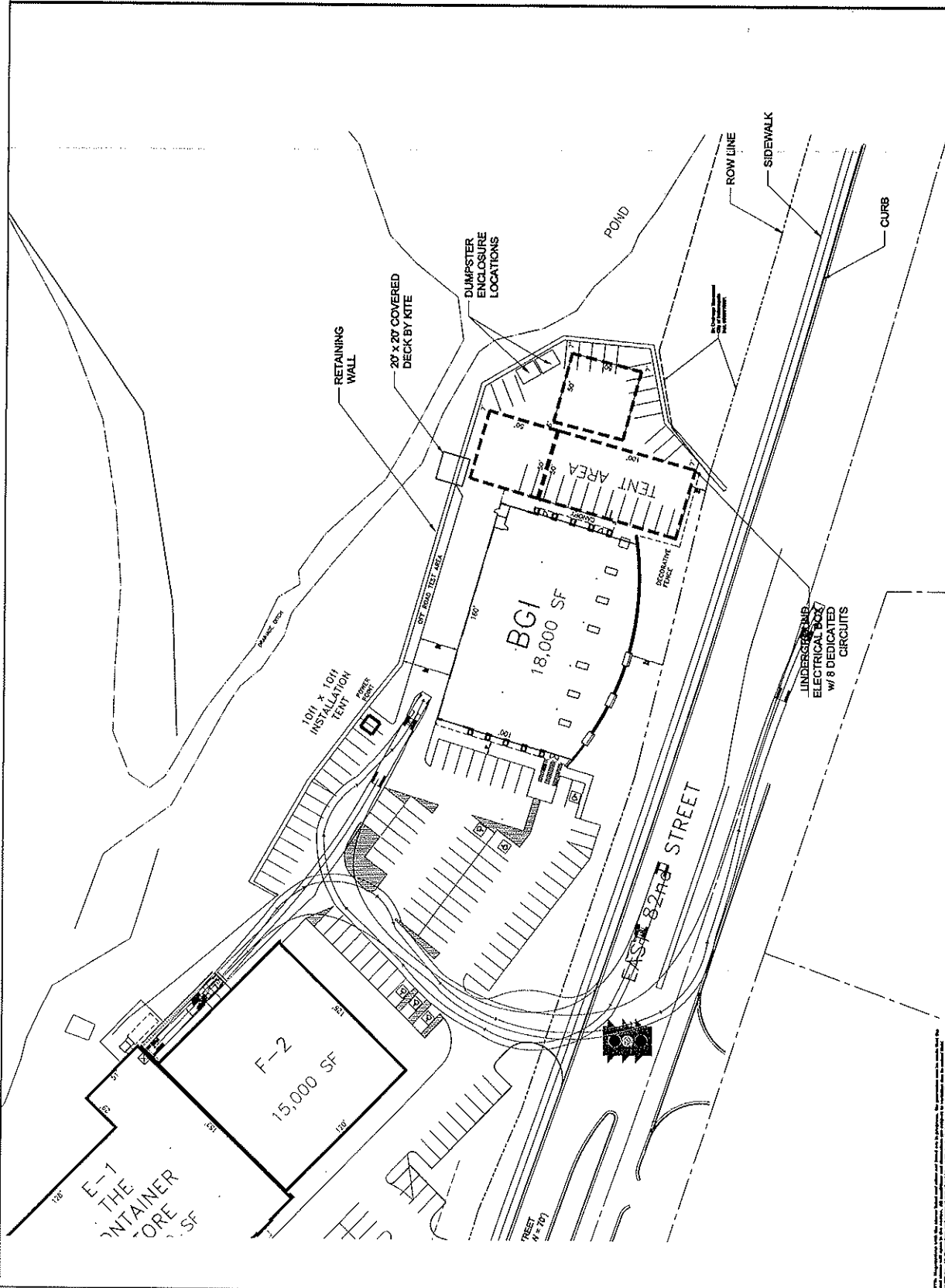
30 S. MERIDIAN STREET
SUITE 1100
INDIANAPOLIS, IN 46204
PHONE 317-577-5600
FAX 317-577-5605

RIVERS EDGE
PLAZA
INDIANAPOLIS,
INDIANA

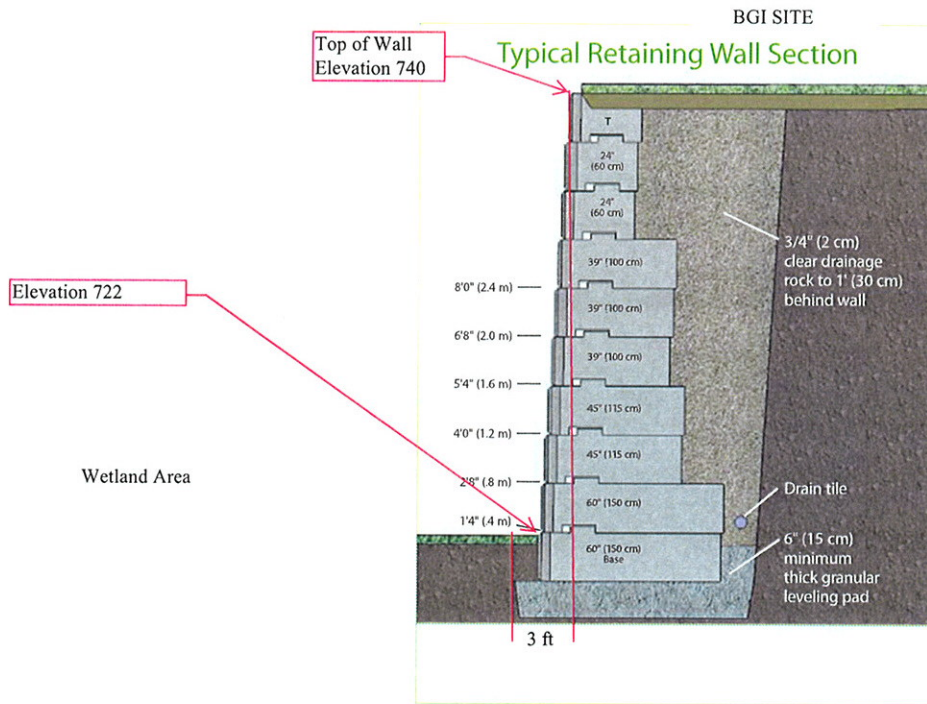
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Date: 11/28/10
Scale: 1"=30'

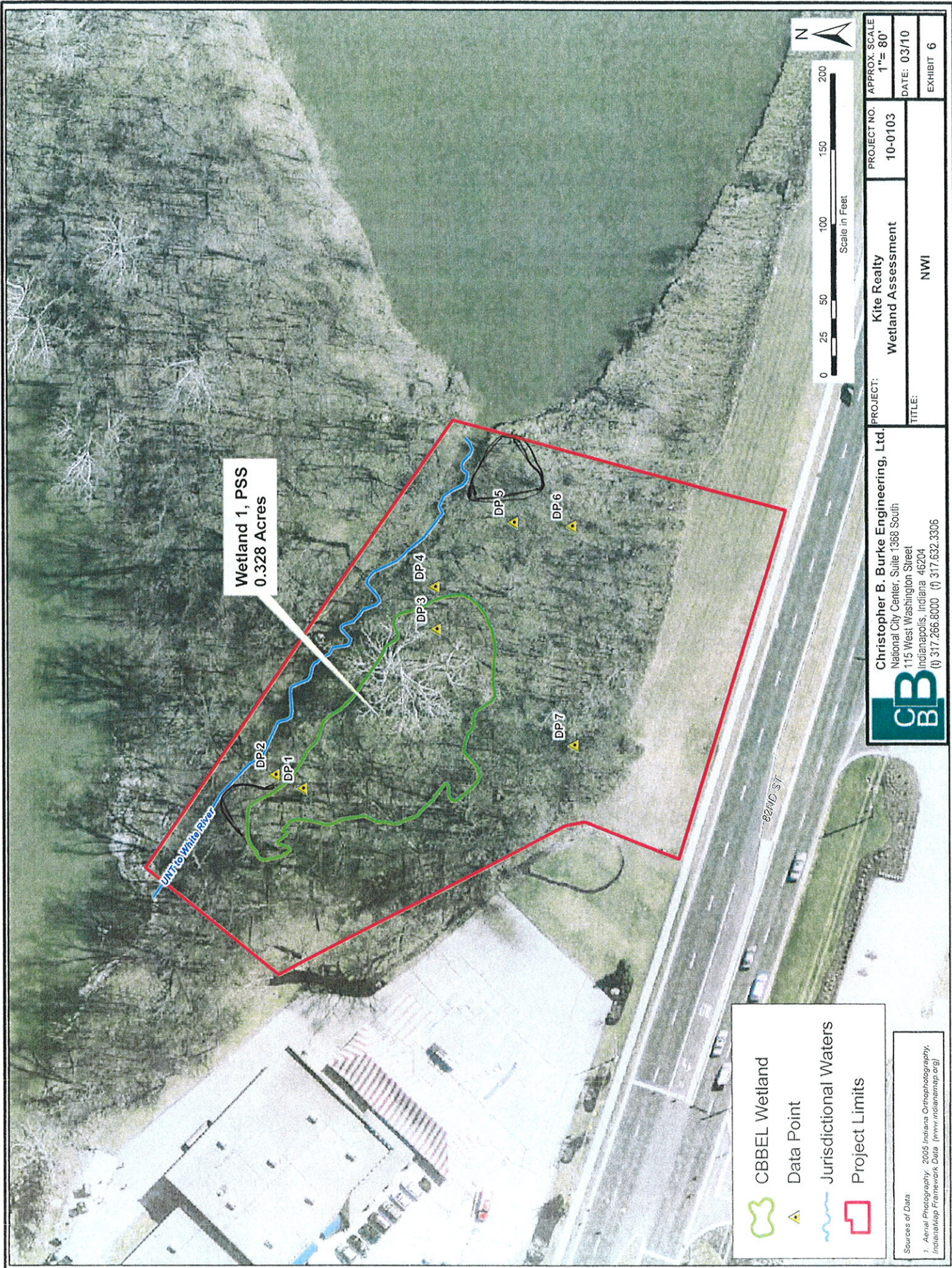
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DEVELOPMENT
Project No: K-07018
SP 100






RIVERS EDGE - RETAINING WALL TYPICAL SECTION





Wetland 1, PSS
0.328 Acres

-  CBBEL Wetland
-  Data Point
-  Jurisdictional Waters
-  Project Limits

Sources of Data
1. Aerial Photography, 2005 Indiana Orthophotography, Indianapolis Framework Data (www.indianamap.org)

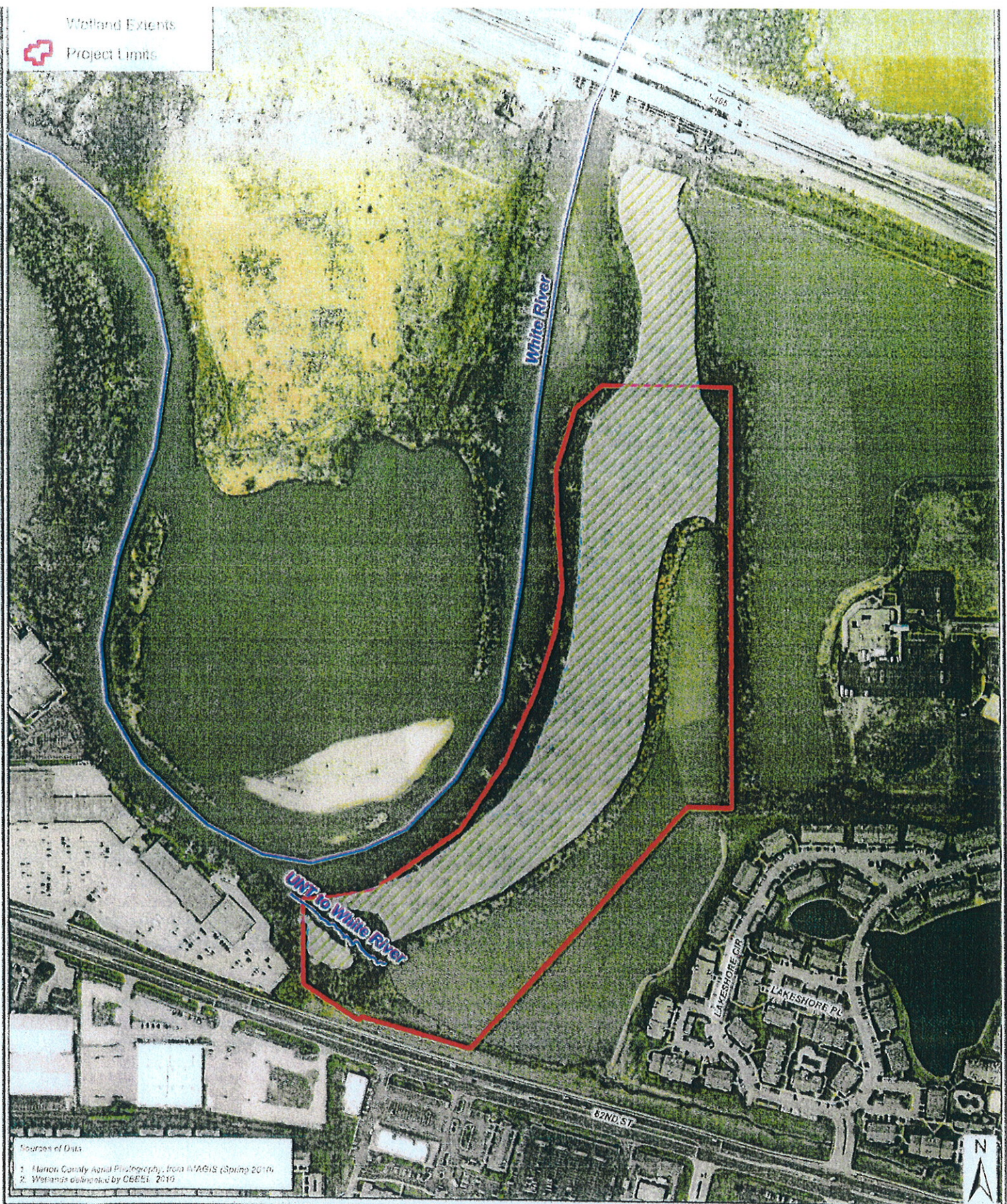
Christopher B. Burke Engineering, Ltd.
National City Center, Suite 1368 South
115 West Washington Street
Indianapolis, Indiana 46204
(317) 266-8000 (317) 317-632.3306

PROJECT:	Kite Realty	PROJECT NO.	10-0103
Wetland Assessment		DATE:	03/10
TITLE:		NWI	EXHIBIT 6

APPROX. SCALE
1" = 80'



Wetland Extents
Project Limits



Source of Data
1. Marion County Aerial Photography, from IVAGIS (Spring 2010)
2. Wetlands delineated by CBEEL 2010



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PROJECT: **WETLAND PRESERVATION & ENHANCEMENT PLAN**
TITLE: **WETLANDS & JURISDICTIONAL WATERS**

PROJECT NO. 02-0554 BG3	APPROX. SCALE 1"=400'
	DATE: 12/2010
	EXHIBIT 6

**PROPOSED
PRESERVATION AND ENHANCEMENT PLAN
FOR THE
RIVER'S EDGE DEVELOPMENT SITE**

Prepared for

Kite Realty Group
30 South Meridian Street, Suite 1100
Indianapolis, Indiana 46204

Prepared by

Christopher B. Burke Engineering, Ltd.
115 West Washington Street, Suite 1368 South
Indianapolis, Indiana 46204

CBBEL Project No. 020554.0004

Revised January 2011

TABLE OF CONTENTS

INTRODUCTION	1
PROPOSED IMPACTS	1
AVOIDANCE AND MINIMIZATION	1
GENERAL INFORMATION	2
PROPOSED WETLAND PRESERVATION	3
EXISTING CONDITIONS – FLORISTIC QUALITY ASSESSMENT	4
PROPOSED ENHANCEMENT GOALS AND OBJECTIVES	5
ENHANCEMENT ACTIVITIES	6
MANAGEMENT ACTIVITIES	10
MONITORING AND REPORTING	13
METHODS	13

APPENDICES

- Appendix A: Exhibits
- Appendix B: FQA Assessment Data
- Appendix C: Invasive Species Control Recommendations

INTRODUCTION

The River's Edge Development Site is located east of the intersection of Dean Road and 82nd Street, Indianapolis, Marion County, Indiana in Section 20, Township 17N, Range 4E (**Exhibit 1 – Site Location**). The site encompasses approximately 26.25 acres of which about 7.70 acres are located within the floodway of the White River. The majority of the site consists of delineated scrub-shrub and forested wetland with the remaining areas being primarily mesic and upland forest. A small 0.328 acre scrub-shrub wetland is located nearest to 82nd Street and is separated from the larger forested wetland complex by Allison Run. The site contains many high quality mature trees but is also overrun by several exotic and invasive species. The site is located on the northeast side of Indianapolis within a highly developed commercial area. This parcel of land is one of the few remaining natural areas that can be found within Marion County.

PROPOSED IMPACTS

Due to growing business demands, the Bicycle Garage Indy needs to expand from its current shop located at 4130 East 82nd Street. The new building will be constructed immediately to the east of the current site, and will consist of a 24,000 square foot structure and associated parking areas. The proposed building will result in a total of 0.12 acre impact to the existing delineated 0.328 acre scrub-shrub wetland (Wetland Site 1). The new Bicycle Garage Indy building will be constructed outside of the regulatory floodway and will not impact Allison Run or the White River.

AVIODANCE AND MINIMIZATION

The following avoidance and minimization measures have been taken to avoid wetland, stream, and floodway impacts:

1.) Two level structure: To reduce the impact to the adjacent wetland the proposed 24,000 SF building expansion will be two levels with 18,000 square feet on the first level and 6,000 square feet of interior second story mezzanine for office and storage use. This reduces the building footprint and the impact on the wetland, adjacent stream, and regulatory floodway.

2.) Parking lot: The parking for the center will be 4.0 spaces per 1,000 square feet of retail area. This is the lowest amount of spaces allowed by the Indianapolis Marion County Code for a shopping center. The loading areas and interior landscape and sidewalk areas have also been minimized to reduce impacts.

3.) Expansion of the existing shopping center: The proposed building shares existing access and drive aisles with the entire shopping center; therefore additional access will not be constructed for the new Bicycle Garage Indy building.

4.) Vertical Wall: A concrete block wall will be used on the northern face of the proposed building to reduce the impacts to and construction activity within the

adjacent wetland (as opposed to a more gradual slope).

5.) Stormwater Quality Treatment: All runoff from the proposed site and building will pass through a mechanical Best Management Practice (BMP) stormwater device before discharge into the White River.

GENERAL INFORMATION

Exhibit 2 - NWI

The National Wetlands Inventory (2009) indicates a palustrine forested wetland (PFO1A) throughout the southern portion of the site. This wetland includes the delineated Wetland Site 1. The remainder of the site is not included on the NWI; however the NWI only serves as a large scale guide and does not preclude the existence of additional wetland areas.

Exhibit 3 - Soils

The soils identified within the site boundary (SSURGO 2010) include Genesee Silt Loam (Ge) and the Fox Complex (FxC2). Neither of these soils are considered hydric, however hydric properties may develop over time due to extended periods of inundation and saturation.

Genesee Silt Loam

The Genesee series consists of very deep well drained soils that formed in loamy alluvium on flood plains. Slope ranges from 0 to 2 percent. The Genesee soils are found along streams in areas of Wisconsinan glaciation. The potential for surface runoff is very low or low. These soils are subject to flooding at periodic intervals unless protected by a levee. The native vegetation is deciduous forest, chiefly of beech, elm, hickory, hackberry, buckeye, sugar maple, and ash.

Fox Complex

The Fox series consists of very deep, well drained soils which are moderately deep to stratified calcareous sandy outwash. These soils formed in thin loess and in loamy alluvium or just in loamy alluvium overlying stratified calcareous sandy outwash on outwash plains, stream terraces, valley trains, kames, and glacial moraines. Slopes range from 0 to 35 percent. Native vegetation is hardwood forest. Common trees are northern red oak, white oak, sugar maple, black cherry, and white ash.

Exhibit 4 - Topography

The 2-Foot contour mapping for this area (IMAGIS 2003) indicates that the site is relatively flat and low lying compared to the developed upland areas surrounding it. Several small channels and draws can be clearly seen from the topography mapping. The site is approximately 10-feet above the White River at this location.

Exhibit 5 - FIRM

The digital Flood Insurance Rate Map (IMAGIS 2010) indicates that a strip ranging from 10-feet to 400-feet wide along the western portion of the site is located within

the regulatory floodway. The remainder of the site is located within the 100-year floodplain.

PROPOSED WETLAND PRESERVATION

Preservation was chosen as the method of compensatory mitigation in this case because long term protection of this particular wetland site will help sustain the overall watershed health. The following discusses the USACE criteria for use of preservation as the means of compensatory mitigation:

i) *The resources to be preserved provide important physical, chemical, and biological functions for the watershed*

The proposed preservation site is located within the north-central portion of the Upper White River HUC watershed, directly adjacent to the White River. The wetland/floodplain complex provides critical flood storage and nutrient uptake for this watershed. The large size of the proposed preservation site (27 acres) allows it to provide significant flood storage volume, and because the site is largely forested wetland it can handle even larger volumes because of the uptake of the tree species.

ii) *The resources to be preserved contribute significantly to the ecological sustainability of the watershed*

The Upper White River Watershed is quickly developing and is already nearly 90% urbanized. Protection of large contiguous sites, particularly those adjacent to major waterways contribute significantly to the sustainability of the watershed. The proposed preservation site houses many mature trees and provides habitat for a variety of woodland and wetland flora and fauna.

iii) *Preservation is appropriate and practicable*

This site is particularly appropriate for preservation because it is owned by the same owner as the impact site. A unique opportunity exists with this site, because the owner is willing to donate the preserved wetland to the Indianapolis Parks Department for future City Parks land.

iv) *The resources are under threat of destruction or adverse modifications*

The site is located within a highly commercial portion of Marion County and is surrounded on all sides by development. Less than 30% of the site is actually within the White River floodway; therefore, the remainder could be developed by the owner. Additionally, the site has visibility from Interstate 465 and 86th Street which makes it even more desirable for development.

v) *The preserved site will be permanently protected through an appropriate real estate or other legal instrument*

The site will be protected through the implementation of the Corps approved deed restriction. A copy of the signed and recorded deed restriction for the preservation area will be submitted with the final monitoring report. The Corps shall be notified in writing prior to the transfer of the mitigation site to another entity or individual. Permanent protection shall transfer with the property

EXISTING CONDITIONS – FLORISTIC QUALITY ASSESSMENT

A Floristic Quality Assessment (FQA) was conducted on October 28, 2010, within the 0.328 acre scrub-shrub wetland (Impact Site) and also within the remaining approximately 26 acre wetland/floodplain complex (Preserved Wetland). Summary data from both inventories is listed below. See Appendix B for comprehensive plant lists for each site.

FQA Data Summary - Impact Site

Native Species	21
Total Species	27
Percent Native	77.8
Mean C Value	2.00
FQI Value	10.60
Mean Wetness	FAC+

FQA Data Summary - Preserved Wetland

Native Species	40
Total Species	50
Percent Native	80
Mean C Value	2.00
FQI Value	14.40
Mean Wetness	FAC

Field observations showed that 21 out of 27 (77.8%) inventoried species at the Impact Site and 40 out of 50 (80%) inventoried species at the Preserved Wetland site were native. The percent native would likely increase if sampling is conducted in both the spring and the fall season. Also, control of invasive species would allow more native species to become prevalent. The observed mean C-value (including non-natives) at both sites is 2.0. This will likely increase following the installation of native woodland understory seed and the resurgence of existing native tree and shrub species.

The FQI value for the Impact Site was 10.6 and the FQI value for the Preserved Wetland Site was 14.4. The FQI value within the Preserved Wetland was likely greater due to its much larger size. As invasive and exotic species are controlled and native species are installed, planted and colonizing species will increase the diversity of natives and the FQI will also increase. The mean C-value and FQI of the Preserved Wetland Site will continue to be monitored and compared year to year as a measure of the site's development.

To put the mean C-value and FQI score in perspective, *Floristic Quality Assessment for Vegetation in Illinois*, (Taft, Wilhelm, Ladd, and Masters, 1997) states:

"In well designed and implemented projects, the mean C and FQI values rise relatively steadily and begin to stabilize after 4 or 5 years. By the end of the first complete growing season it is not uncommon to have mean C values of 1 or less and FQI values of 4 or 5. After 5 years of management one can expect mean C values between 3.0 and 3.5, with FQI values ranging from 25 and 35."

PROPOSED ENHANCEMENT GOALS AND OBJECTIVES

The goals for Preservation and Enhancement of the River's Edge Wetland include:

- 1) Reduce the presence of exotic and invasive species
- 2) Successional re-establishment of native shrub layer in areas that are currently dominated by honeysuckle (*Lonicera spp.*)
- 3) Re-establish herbaceous layer with native wetland/woodland vegetation in areas that are currently dominated by wintercreeper (*Euonymus fortunei*)
- 4) Provide valuable habitat for wildlife species within a primarily commercial urban area
- 5) Provide continued monitoring and adaptive management
- 6) Donate the Preserved Wetland site to the City of Indianapolis Parks Department
- 7) Utilize existing pathways to provide access and viewing for the future park
- 8) Protect the site in perpetuity through a conservation easement or deed restriction

The proposed enhancement activities would focus on enhancing and improving the wetland area to restore a higher quality, native forested wetland community and mesic forest. Vegetation and habitat enhancements will include the removal and herbicide treatment of non-native and invasive vegetation including wintercreeper, honeysuckle, reed canary grass, and garlic mustard. These tasks will include mechanical and/or hand removal of the targeted woody vegetation and herbicide treatment of stumps where invasive species roots are not removed or girdling of larger shrubs. As determined in the field based on site conditions, all brush will be cut, stacked and burned in appropriate locations, mechanically chipped and thinly spread in appropriate locations, hauled off-site or disposed of with a combination of

these methods. Undesirable, non-native or invasive herbaceous vegetation will be controlled with the use of site specific herbicides.

Upon completion of weed control activities, the restored areas will be seeded with appropriate seed mixtures and/or planted within specified woody vegetation. The following details proposed enhancement activities including site access, mechanical shrub clearing and brushing, weed control spraying, supplemental seeding and continued vegetation management and monitoring.

ENHANCEMENT ACTIVITIES

The wetland enhancement activities will include:

- 1) Removal of non-native, invasive shrubs, specifically, wintercreeper and honeysuckle.
- 2) Removal of non-native and invasive understory vegetation, specifically, reed canary grass and garlic mustard.
- 3) Removal trash and debris from the site
- 4) Supplemental seeding of woodland/wetland understory species
- 5) Reintroduction of a prescribed burn regime
- 6) Utilize existing trail system
- 7) Installation of a shelter or overlook within a specified upland area

Access and Equipment

Access to the preservation area will occur with minimizing impact to wetland and upland habitats. The Contractor shall not park any vehicles or block traffic on the public roadway and, if appropriate, provide appropriate signage for vehicles leaving and entering the site. All public roadways shall be kept clean of any debris from site work, and all posted weight limits will be respected.

The site owner or designee will designate all access routes and equipment access points throughout the preserved area to minimize potential damage to desirable vegetation. The access routes and access points will be agreed upon with the owner or designee during a field meeting prior to the beginning of the work.

Access to the preservation site shall not permanently impact any wetland or Waters of the U.S. areas as shown on **Exhibit 6 – Wetland and Jurisdictional Waters** in Appendix A. A temporary crossing over Allison Run will be required, and these impacts will be included in the Section 404 and 401 permit applications.

Damage caused by Contractor vehicles and equipment to trails and access routes will be the responsibility of the Contractor. All areas damaged (pitting, rutting, erosion) during the work activities will be repaired and reseeded by the Contractor with the approved seed mixture as shown below.

No equipment shall be used on steep slopes and only hand clearing will occur in these locations. If equipment cannot access an area or cannot enter without damage to soil or desirable vegetation, all cutting of vegetation within that area shall be performed by hand using chain saws or brush clearing saws, hand saws and loppers.

Protection of the Work Zone

Only the listed woody understory species shall be cut, removed and treated with herbicides. All remaining trees and shrubs shall be avoided. During the on-site meeting with the property owner, or designee, the Contractor will be shown the target species for removal. All personnel involved in the removal of the target species will be familiar with the identification of all of the species to be removed and the native species to be preserved. The Contractor will be well versed in vegetation restoration implementation techniques and practices.

Adverse impacts to preserved tree and shrub trunks and stems will be minimized to the extent possible. Soil compaction and excessive soil disturbance due to rutting and clearing will be avoided. Materials, site debris, vehicles, and construction equipment, shall be stored in areas designated by the owner or designee.

Mechanical Clearing and Brushing

A. Control of Seedlings and Small Invasive Stems

Where appropriate to protect preserved vegetation, trees and shrubs, invasive stems less than 3/8 inch in diameter will be removed by hand. Small seedlings will be pulled and will not re-sprout. If greater than 3/8 inch, a hand tool that pulls the small shrub out, such as a Weed Wrench or Root Talon, will be used. Hand removal tools come in a variety of sizes and can remove honeysuckle and wintercreeper stems up to 2.5 inches in diameter.

In areas with a high density of small stems, and where pulling individual plants is impractical, spray foliage of the short multiple seedlings with a herbicide that will kill actively growing vegetation on which it is sprayed.

B. Control of Larger Stems

Infested areas adjacent to trees and shrubs to be preserved, invasive shrubs that are two inches in diameter or larger will be best controlled by cutting the stem at the soil surface and then treating the cut stump to prevent re-sprouting. Species targeted will include honeysuckle and wintercreeper. This will be effectively done with hand tools including chain saws or brush cutters and with mechanical clearing and brushing equipment. Hand removal will be completed by cutting the vegetation as close to the ground surface as possible and treating each cut stem with an appropriate herbicide to prevent resprouting. Care should be taken not to remove tree and shrub roots or disturb surrounding soil.

Mechanical clearing and brushing using a Seppi mower, Royer mower, or equivalent, can occur in heavily infested areas where limited desirable vegetation exists and preserved trees and shrubs are sparse in the work area. Clearing and brushing will only occur when ground conditions are adequately dry or frozen so as to prevent rutting or compaction. Burning of debris may be permitted onsite as needed. Chipping will be permitted, however chipped material may not be stockpiled except in designated areas. The Contractor will dispose of all surplus, or unsuitable materials, in such a manner that public or private property will not be damaged or endangered. Grubbing of stumps is not permitted. Woody material from clearing operations will not be allowed to accumulate deeper than 2" to prevent desirable native species being smothered or prevented from emerging.

This work shall also consist of the application of herbicide to all cut stumps within 8 hours of cutting. All material will be brought to the spray area in the original, unopened containers supplied by the manufacturer. Garlon 4, or equal selective and non-residual herbicide will be applied at the rate specified on the label. For cut stumps, root flares, and stems, Garlon 4 or equivalent, will be applied with a manufacturer approved dye on the cambium. A 20% solution of Garlon 4 in basal oil with dye will be applied when temperatures are below 80°F.

Herbaceous Weed Control

This work shall consist of the application of a non-selective and non-residual herbicide (Aquaneat or equal) with dye for the control of invasive herbaceous weeds in the existing wetland preservation area. The work to be completed can be conducted with spot spraying, wick, or boom spray herbicide applications in the wetland area. Invasive wetland weeds to be treated include garlic mustard (*Alliaria petiolata*) and reed canary grass (*Phalaris arundinacea*).

The non-selective and non-residual herbicide shall be applied at the appropriate rates and according to label directions. The diluted solution shall be sprayed on invasive weeds in dry conditions. If herbicide applications are completed and the rainfall period is not completed (4 hours), the herbicides shall be reapplied.

The Contractor shall submit the following after the work is completed:

1. The chemical names of the compound and the rate used.
2. Weather conditions.
3. Approximate locations and acreages herbicided.
4. Names and rates of surfactants drift control agents, or other additives used with the product. These tank mix additives shall be used as specified by the manufacturer. Required additives will not be paid for separately.
5. Photograph documentation of herbiciding activities.

All material shall be brought to the spray area in the original, unopened containers supplied by the manufacturer.

Supplemental Broadcast Seeding

The work will consist of using a broadcast or drill seeder to apply the following forested wetland understory seed mixture in areas disturbed by shrub removal or herbicide application. The seed mix will be applied in pounds of Pure Live Seed (PLS) for selected species. Native grass and forb seed species will be local genotype and will be from a radius of 150 miles from the site. If mechanical seed installation is impractical, seed should be installed by hand broadcast. For this method, seed should first be mixed with moist sawdust or peat moss and then be raked into the soil so that it is covered by 1/4 to 1/2 inch of dirt.

No seed will be sown during high winds or when the ground is not in a proper condition for seeding, nor will seed be sown until the purity test has been completed for the seeds to be used, and shows that the seed meets the noxious weed seed requirements. The seeding dates for the mixture will be from April 30 to July 30 and from October 30 to December 15. The owner or designee will be notified 48 hours prior to beginning the seeding operations.

The following seed mixture will be used within all areas that area disturbed by shrub removal, herbicide application, or a combination of the two:

Common Name	Scientific Name	Ounces/Acre
<i>Graminoids:</i>		
Frank's Sedge	<i>Carex frankii</i>	2
Burr Sedge	<i>Carex grayi</i>	2
Common Hop Sedge	<i>Carex lupulina</i>	2
Palm Sedge	<i>Carex muskingumensis</i>	1
Spreading Oval Sedge	<i>Carex normalis</i>	1
Pointed Oval Sedge	<i>Carex tribuloides</i>	1
Fox Sedge	<i>Carex vulpinoidea</i>	2
Riverbank Wild Rye	<i>Elymus riparius</i>	16
Virginia Wild Rye	<i>Elymus virginicus</i>	64
Fowl Manna Grass	<i>Glyceria striata</i>	2
Bottlebrush Grass	<i>Hystrix patula</i>	3
<i>Forbs:</i>		
Wingstem	<i>Actinomeris alternifolia</i>	2
Side-Flowering Aster	<i>Aster lateriflorus</i>	2
Swamp Aster	<i>Aster puniceus</i>	1
Panicled Aster	<i>Aster simplex</i>	2
Hairy Wood Mint	<i>Blephilia hirsuta</i>	0.5
Autumn Sneezeweed	<i>Helenium autumnale</i>	2
False Sunflower	<i>Heliopsis helianthoides</i>	2
Great Blue Lobelia	<i>Lobelia siphilitica</i>	0.5
Monkey Flower	<i>Mimulus ringens</i>	0.5
Smooth Penstemon	<i>Penstemon calysosus</i>	1

Green-Headed Coneflower	<i>Rubbeckia laciniata</i>	2
Cupplant	<i>Silphium perfoliatum</i>	3
Late Goldenrod	<i>Solidago gigantea</i>	1.5
Culver's Root	<i>Veronicastrum virginicum</i>	0.5
Golden Alexanders	<i>Zizia aurea</i>	2
Temporary Cover:		Pounds/Acre
Seed Oats	<i>Avena sativa</i>	60
Annual Rye Grass	<i>Lolium perenne</i>	60
		120

Passive Recreational Amenities

The Indianapolis Park Department plans to utilize the existing trails which pass through the preserved wetland area to facilitate viewing of the preserved and enhanced natural areas. Additionally, a shelter or overlook will be installed in a designated upland area. It is recommended that City place interpretive signs along the trails describing the restoration activities, wetland and upland habitats, wildlife typical of the area, or the ecological importance of the site. These amenities will provide both a recreational and educational aspect to River's Edge site.

MANAGEMENT ACTIVITIES

Continued periodic maintenance and management of the site will be necessary upon completion of the initial enhancement activities. Required maintenance and management activities will be needed to control invasive species resprouts and recolonization, promote the establishment of the desired supplemental seed mixes, trees and shrubs, and provide monitoring of the site for adaptive management purposes. The following restoration maintenance and management activities should be implemented by the owner:

1. A meander survey should be utilized to obtain quantitative and qualitative data to effectively monitor invasive species distribution and temporal changes in vegetative composition over time. Quantitative and qualitative sampling data can be collected semi-annually in following years to evaluate changes in community composition. This data will be used to evaluate success in meeting the restoration goals and objectives and in developing adaptive management strategies to control undesirable vegetation and promote the establishment of native species composition and increased plant diversity.
2. Site monitoring visits and debris management should be implemented within the restoration site to assess the overall condition of the site including invasive weed growth and vegetation establishment. Any deficiencies will be documented along with recommendations for appropriate remediation, or remedied during the visits. Trash, brush, construction debris, etc. should be periodically removed from the restoration site and disposed of in an appropriate location. Landscape waste and debris will not be dumped into

restoration site. The results of periodic site monitoring visits should be summarized in a short report with photographs.

3. An Annual Monitoring Report will be submitted to the owner, for ultimate submittal to the U.S. Army Corps of Engineers (USACE) and the Indiana Department of Environmental Management (IDEM), noting the enhancement, maintenance, and management activities that occurred during the year. It could also contain the following information:
 - A. Inventory of the total number of adventive plant species and total native plant species identified onsite.
 - B. Plant Community Quality - Calculate the native mean C value and FQI value for the site
 - C. Recommendations for future enhancement activities

The report shall include a review of progress in meeting restoration goals, objectives and proposed actions to deal with any shortfalls.

4. Continued invasive weed control should be implemented to target resprouts and recolonizing non-native and undesirable vegetation. Particular attention will be given to the targeted invasive species including honeysuckle, wintercreeper, garlic mustard, and reed canary grass. However, as increased light is available on the forest floor, additional weed species are likely to be encountered such as sweet clover, teasel, thistle, and other non-native and invasive species. These undesirable resprouts and colonizers will be controlled mechanically through the use of early summer mowing, hand removal, culturally through the use of prescribed fire as described below, chemically through the application of herbicides on shrubs and persistent perennial weeds or a combination of methods.

Periodic shrub cutting, with follow-up herbicide applications, is expected to be highly effective in controlling resprouts and recolonizing invasive vegetation. Selective mowing in supplementally seeded areas that is performed near the start of flowering season can dramatically reduce the flowers that are pollinated and form seeds leading to the spread of additional invasive herbaceous vegetation. Special mowing of native seeding areas may be used as necessary in the first two years following seed installation to promote native grasses and forbs and discourage weeds. The newly seeded native areas may be mowed once or twice per year (early June and/or early August) to a height not lower than 8 inches. Mowing at this frequency and height reduces the production of weed seeds without adversely affecting native grass and forb establishment. After year 2, entire areas of establishing native vegetation will not be mowed. However, spot-mowing using a hand-held weed trimmer can be used to reduce individual stems of annual weeds (e.g. ragweed), biennials (e.g. sweet clover, teasel), and sometimes perennials

(e.g. thistle) early in their flowering stages to prevent the formation of seeds. Care should be taken to avoid newly planted tree and shrub species. Newly planted woody species should be identified with flagging so that herbaceous vegetation in these areas can be mowed with a hand held trimmer.

Weed species will be herbicided and/or mowed only after proper identification. Detailed weed control information is provided in the Invasive Weed Species Management Recommendations in Appendix C.

5. Short-term and long-term prescribed fire management techniques should be utilized to enhance the control of invasive species and the modification of community structure. This management option helps to reduce undesirable weedy species and encourage native species. Prescribed burning reduces the accumulation of plant litter, thereby creating openings for the germination and establishment of native species. These burns will only be performed by qualified burn managers. Burning is particularly effective after the third growing season following native seed installation. Implementation of a short-term and long-term prescribed burn program will aid in the restoration of native community composition and structure in areas subjected to the encroachment of invasive and non-native species. The proposed short-term fire frequencies, as recommended by the Chicago Wilderness, are as follows:

Short-term

1-2 Years – upon completion of the initial restoration work, weed control and seed establishment, the restoration area shall be burned on a more frequent schedule every 1 to 2 years as fuels allow and provided required permits can be obtained. This fire frequency will be applied until invasive species control and appropriate community structure is achieved, at which time, the transition to the long-term fire frequencies will occur.

Long-term

3-5 Years – as the restoration area establishes and matures, infrequent prescribed burning will be implemented as fuels allow and provided required permits can be obtained.

6. Supplemental seeding will be utilized as necessary to increase vegetative diversity, provide ground cover for exposed areas or promote specific wildlife objectives. Supplemental seeding within the restoration areas may be necessary in the event extensive weed control and herbicide treatment leaves areas devoid of vegetation. The previously listed seed mixes will be utilized as necessary

MONITORING AND REPORTING

A representative of the owner (or designee) will periodically visit the project to monitor the progress and condition of the preservation site during enhancement activities. These visits will be used to evaluate whether herbicide application and installation are consistent with the approved plan, that good horticultural practices are used, and that proper erosion control measures are in place.

After initial enhancement activities are complete, the site will be monitored by the for a minimum period of five (5) years. These monitoring visits will document progress toward meeting the success criteria and will identify corrective action required to meet the success criteria. Annual reports will be submitted to the regulatory agencies. The success criteria must be met for two (2) consecutive years within a five (5) year period in order to be released from monitoring. Once this requirement is met, a final monitoring report will be submitted along with a request for final approval of the mitigation and termination of further monitoring.

SUCCESS CRITERIA

The proposed success criteria for the mitigation areas are as follows:

1. The preserved wetland area must have equal or greater mean FQI and mean C-values than the baseline data.
2. Wetland preservation areas, as delineated in September 2010, must continue to meet wetland criteria per the United States Army Corps of Engineers Wetland Delineation Manual Technical Report Y-87-1 (January, 1987) and the Midwest Regional Supplement (2008).
3. Presence of target exotic and invasive species (*Lonicera spp.*, and *Euonymus spp.*) must be reduced by at least fifty percent.
4. No more than 15% of the surface area coverage of the newly seeded wetland areas may be open water, bare ground, or a combination of the two. Open water and bare ground are defined as areas with less than 10% aerial vegetative cover.
5. Site protection signage has been installed, and there is no evidence of encroachment onto the site.

METHODS

Herbicide application and installation of native seed will be observed to ensure compliance with the approved preservation/enhancement plan and use of proper planting and stabilization materials, quantities, and techniques.

Monitoring will commence the summer following the initial herbicide applications and seed installation, and will occur semi-annually. Data collected will involve vegetative success, success of exotic and invasive eradication, and soils and hydrology data to ensure the site's continued existence as a wetland. Any need for remedial work will require additional site visits and data collection. The monitoring report will include representative photographs of the mitigation site.

Vegetation – A meander survey will be conducted on a semi-annual basis to provide floristic data covering the entire growing season. Ocular estimates for percent cover of target exotic and invasive species will be made at randomly selected sampling points within the treatment areas, and used to project overall reduction in these species.

Wetland Criteria – A wetland delineation will be performed at the site annually. Primary and secondary indicators of hydrology will be recorded. Soil samples will be taken and examined for the presence of hydric soils.

FQI Data Summary - Existing Wetland (Impact Site)

Native Species	21
Total Species	27
Percent Native	77.8
Mean C Value	2.00
FQI Value	10.60
Mean Wetness	FAC+

FQI Data Summary - Preserved Wetland

Native Species	40
Total Species	50
Percent Native	80
Mean C Value	2.00
FQI Value	14.40
Mean Wetness	FAC

FQI Data - Existing Wetland (Impact Site) Inventory

Acronym	C-Value	Scientific Name	Common Name	Physiognomy	Indicator Status
ACNEG	1	<i>Acer negundo</i>	Box Elder	Native Tree	FACW-
ACESAI	1	<i>Acer saccharinum</i>	Silver Maple	Native Tree	FACW-
ACESAS	4	<i>Acer saccharum</i>	Sugar Maple	Native Tree	FACU
BOECYC	3	<i>Baehmeria cylindrica</i>	False Nettle	Native Forb	OBL
CXGRAY	5	<i>Carex grayi</i>	Common Bur Sedge	Native Sedge	FACW+
CELOCC	3	<i>Celtis occidentalis</i>	Hackberry	Native Tree	FAC-
CIRLUC	2	<i>Circaea lutetiana s. canadensis</i>	Enchanter's Nightshade	Native Forb	FACU
EUOFOR	0	<i>Euonymus fortunei</i>	Wintercreeper	Adventive Shrub	UPL
FRAPEL	1	<i>Fraxinus pennsylvanica v. lanceolata</i>	Green Ash	Native Tree	FAC
EUPROT	1	<i>Eupatorium rotundifolium</i>	Round-leaved Thoroughwort	Native Forb	UPL
HYDVIR	4	<i>Hydrophyllum virginianum</i>	Virginia Waterleaf	Native Forb	FACW-
LONTAT	0	<i>Lonicera tatarica</i>	Tartarian Honeysuckle	Adventive Shrub	FACU
LYSCIL	4	<i>Lysimachia ciliata</i>	Fringed Loosestrife	Native Forb	FACW
MACPOM	0	<i>Maclura pomifera</i>	Hedge Apple	Adventive Tree	FACU
MALIOE	3	<i>Malus ioensis</i>	Iowa Crab	Native Tree	UPL
MORALB	0	<i>Morus alba</i>	White Mulberry	Adventive Tree	FAC
PERPEN	0	<i>Persicaria pensylvanica</i>	Pinkweed	Native Forb	FACW+
PERVUL	0	<i>Persicaria vulgaris</i>	Lady's Thumb	Adventive Forb	FACW
PLAOCC	3	<i>Platanus occidentalis</i>	Sycamore	Native Tree	FACW
RIBAME	5	<i>Ribes americanum</i>	Wild Black Currant	Native Shrub	FACW
RUBLAC	0	<i>Rubus laciniatus</i>	Cut-leaved Blackberry	Adventive Shrub	UPL
SAMNIC	2	<i>Sambucus nigra s. canadensis</i>	Common Elderberry	Native Shrub	FACU-
SMIROT	4	<i>Smilax rotundifolia</i>	Cat Brier	Native Vine	FAC
SYMLAN	3	<i>Symphoricarpon lanceolatum</i>	Panicled Aster	Native Forb	OBL
TOXRAR	1	<i>Toxicodendron radicans s. radicans</i>	Poison Ivy	Native Vine	FACU
ULNAME	3	<i>Ulmus americana</i>	American Elm	Native Tree	FACW-
VIOSOR	1	<i>Viola sororia</i>	Woolly Blue Violet	Native Forb	FAC-

FQI Data - Preserved Wetland Inventory

Acronym	C-Value	Scientific Name	Common Name	Physiognomy	Indicator Status
ACNEG	1	<i>Acer negundo</i>	Box Elder	Native Tree	±ACW-
ACESAI	1	<i>Acer saccharinum</i>	Silver Maple	Native Tree	±ACW-
AESGLA	5	<i>Aesculus glabra</i>	Ohio Buckeye	Native Tree	±AC+
ALLPET	0	<i>Alliaria petiolata</i>	Garlic Mustard	Adventive Forb	±AC
AMARET	0	<i>Amaranthus retroflexus</i>	Rough Pigweed	Adventive Forb	FACU+
AMBTRI	0	<i>Ambrosia trifida</i>	Giant Ragweed	Native Forb	±AC+
ASACAN	5	<i>Asarum canadense</i>	Canada Wild Ginger	Native Forb	UPL
ASITRI	6	<i>Asimina triloba</i>	Pawpaw	Native Tree	±AC
CXGRAY	5	<i>Carex grayi</i>	Common Bur Sedge	Native Sedge	FACW+
CARCOR	5	<i>Carya cordiformis</i>	Bitternut Hickory	Native Tree	±AC
CELOCC	3	<i>Celtis occidentalis</i>	Hackberry	Native Tree	±AC-
CORRAC	2	<i>Cornus racemosa</i>	Gray Dogwood	Native Shrub	±ACW-
ELYVIR	3	<i>Elymus virginicus</i>	Virginia Wild Rye	Native Grass	FACW-
EUOFOR	0	<i>Euonymus fortunei</i>	Wintercreeper	Adventive Shrub	UPL
EUPROT	2	<i>Eupatorium rotundifolium</i>	Round-leaved Thoroughwort	Native Forb	UPL
EUPSER	0	<i>Eupatorium serotinum</i>	Late Boneset	Native Forb	FAC+
FRAPEL	1	<i>Fraxinus pennsylvanica v. lanceolata</i>	Green Ash	Native Tree	±AC
GEUCAN	1	<i>Geum canadense</i>	White Avenas	Native Forb	FAC
GLEHED	0	<i>Glechoma hederacea</i>	Gronud ivy	Adventive Forb	FACU+
GLETRI	1	<i>Gleditsia triacanthos</i>	Honey Locust	Native Tree	FAC
HELGRO	3	<i>Helianthus grosseserratus</i>	Sawtooth Sunflower	Native Forb	±ACW-
HYDVIR	4	<i>Hydrophyllum virginianum</i>	Virginia Waterleaf	Native Forb	±ACW-
JUGNIG	2	<i>Juglans nigra</i>	Black Walnut	Native Tree	±ACU+
LAPCAN	2	<i>Laportea canadensis</i>	Canada Wood Nettle	Native Forb	±ACW
LEEVR	4	<i>Leersia virginica</i>	White Grass	Native Grass	±ACW
LONTAT	0	<i>Lonicera tatarica</i>	Tartarian Honeysuckle	Adventive Shrub	±ACU
MORALB	0	<i>Morus alba</i>	White Mulberry	Adventive Tree	FAC
OMSLON	0	<i>Osmorhiza longistylis</i>	Anise Root	Native Forb	FACU-
PERPEN	0	<i>Persicaria pensylvanica</i>	Pinkweed	Native Forb	FACW+
PHAARU	0	<i>Phalaris arundinacea</i>	Reed Canary Grass	Adventive Grass	FACW±
PLAOCC	3	<i>Platanus occidentalis</i>	Sycamore	Native Tree	FACW
POAPRA	0	<i>Poa pratensis</i>	Kentucky Blue Grass	Adventive Grass	FAC-

PRUSER	1	<i>Prunus serotina</i>	Wild Black Cherry	Native Tree	FACU
QUEMAC	5	<i>Quercus macrocarpa</i>	Burr Oak	Native Tree	FAC-
RUBLAC	0	<i>Rubus laciniatus</i>	Cut-leaved Blackberry	Adventive Shrub	JPC
RUMCRI	0	<i>Rumex crispus</i>	Curly Dock	Adventive Forb	FAC+
SALINT	1	<i>Salix interior</i>	Sandbar Willow	Native Shrub	OBL
SALNIG	3	<i>Salix nigra</i>	Black Willow	Native Tree	OBL
SAMNIC	2	<i>Sambucus nigra s. canadensis</i>	Common Elderberry	Native Shrub	FACU-
SANCAN	2	<i>Sanicula canadensis</i>	Canadian Black Snakeroot	Native Forb	FACU+
SILPER	4	<i>Silphium perfoliatum</i>	Cup Plant	Native Forb	FACW-
SMIROT	4	<i>Smilax rotundifolia</i>	Cat Brier	Native Vine	FAC
SOLALT	0	<i>Solidago altissima</i>	Tall Goldenrod	Native Forb	FACU
SOLGIG	4	<i>Solidago gigantea</i>	Late Goldenrod	Native Forb	FACW-
TILAMA	5	<i>Tilia americana v. americana</i>	American Linden	Native Tree	FACU
TOXRAR	1	<i>Toxicodendron radicans s. radicans</i>	Poison Ivy	Native Vine	FACU
ULNAME	3	<i>Ulmus americana</i>	American Elm	Native Tree	FACW-
VERALT	3	<i>Verbesina alternifolia</i>	Wingstem	Native Forb	FACW
VIOSOR	1	<i>Viola sororia</i>	Woolly Blue Violet	Native Forb	FAC-
VITRIP	1	<i>Vitis riparia</i>	Riverbank Grape	Native Vine	FACW-

INVASIVE WEED SPECIES CONTROL METHODOLOGIES

The locations, ecological effects and control of invasive species now present on site are described in this section. Control recommendations are from Wisconsin and Illinois DNR, the Illinois Nature Preserves Commission, the Nature Conservancy, and Christopher B. Burke Engineering, Ltd. experience.

Woody Invasive Species

Invasive species can build up extremely dense populations, and displace native species. They have a rapid growth and reproduction rate, cast a dense shade, leaf out prior to native species and hold leaves later in the fall, may emit chemicals that weaken competition from other plants (allelopathy), and resprout vigorously when cut. Buckthorn fruits are readily eaten by birds (especially starlings) and pass through their digestive tract very quickly, spreading the seeds. These species were introduced to the Chicago Region between 100 and 150 years ago for landscaping; most invasion of natural areas in the region occurred between 20 and 60 years ago, or when cattle grazing was stopped and the seeds were spread by birds from nearby urbanized areas.

Ecological effects of invasive woody species include the following:

1. Dense shade eliminates ground layer flora and eventually results in increased erosion.
2. Extensive, matted fibrous root systems and foliage transpiration from stems soaks up water, dewatering wetlands and reducing habitat for native wetland species, and occurs over a long period of time relative to native woody species.
3. Leaf litter of these species decompose rapidly, do not shield soil from rainfall as do oak, hickory and herbaceous leaf litter, thus increasing erosion. Nutrients cycle more rapidly in the environment due to the rapid breakdown of the leaf litter.

WINTERCREEPER (*Euonymous fortunei*)

Wintercreeper can cover the ground and vegetation and eliminate native groundcover species in mesic and dry-mesic forests. It is a serious potential threat because it spreads so rapidly and replaces spring ephemerals. This species also requires multi-year management to reduce re-establishment.

Burning

Often this species establishes where burning is not possible. Burning may be effective where adequate fuels exist.

Chemical Control

Vines should be cut by hand and each cut stem sprayed with a glyphosate

herbicide after the last killing frost. While most glyphosate labels recommend a 50-100% concentration of Roundup for stump treatment, a 20% concentration has proven effective. A squirt bottle may be used for spot treatment or individual stumps can be painted by hand using a sponge applicator. Treatment should be in late winter when most native vegetation is dormant and prior to the emergence of spring wildflowers. Care should be taken to avoid contacting non-target species with the herbicide.

Mechanical Control

In small areas, where practical, individual vines should be pulled up by the roots and removed from the area. The most effective control is to totally eradicate the species from the surrounding area where possible. Invading individuals should be pulled and removed as soon as possible after recognition.

EXOTIC HONEYSUCKLES (*Lonicera sp.*)

Exotic honeysuckle are a prolific shrubby species that colonize in both woodland and open habitats. Seed dispersal over long distances is aided by birds eating the ripened fruit. This species also requires multi-year management to reduce re-establishment.

Burning

Often this species establishes where burning is not possible. Burning may be effective where adequate fuels exist.

Chemical Control

Larger shrubs should be cut and herbicided with Glyphosphate based herbicide (Hoffman and Kearns 1997). Management may be required for several years to control resprouts.

Mechanical Control

Exotic honeysuckle has shallow roots and often younger plants can be uprooted and removed. Soil may be loosest in the spring.

Herbaceous Invasive Species

Herbaceous invasive species can invade both high and low quality habitats with or without disturbance. Herbaceous invasive species can be transported via animals, birds, wind, water, and humans. Seeds can be mixed accidentally in native seed mixes. Humans can potentially introduce seed from an infested area that was attached to their shoes or bike tires. Herbaceous non-native plants can also escape from neighbors' lawns and gardens into natural communities. Herbaceous invasive species can alter the community by shading out natives, taking available resources, changing hydrology or soil chemistry, or changing the community structure.

Provided is a summary of invasive weed species and management options for controlling each species. Species are covered in this Appendix are teasel, garlic

mustard, honeysuckle, reed canary grass, buckthorn, common reed, non-native pasture grasses, catails, purple loosestrife, non-native pasture grasses, sweet clover, Queen Anne's lace, olives, hawthorn, multiflora rose, ragweed, and Canada thistle. Various methods of management (including controlled burns and herbiciding) have different effects on each of these species and are covered in this section. Consistency of attention to control and a variety of control methods provide the best results.

GARLIC MUSTARD (*Alliaria petiolata*)

Garlic mustard often invades shaded, moist areas that have some level of disturbance, such as floodplain forests (Carroll and White 1997). When garlic mustard has established in an area it is often seen in monocultures. It is a shade tolerant plant that is not commonly found in open sunny habitats. This species is somewhat difficult to control because each plant average over 300 seeds and seed can be viable for 5 years (Carroll and White 1997, Hoffman and Kearns 1997). Garlic mustard does not need disturbed sites to spread; it will readily establish into high quality forests. Control can be accomplished through a multi-year program that provides moderate management.

It rapidly forms a carpet of plants which remain green year-round, thus rapidly outcompeting native plants which grow only at certain times of the year. It is a biennial and reproduces very rapidly. The seeds tend to germinate in very early spring, about the time when traditional cool season turf shows the first signs of greenup, sometimes as early as February; and the seedlings are highly cold tolerant. Control should focus on annual inspection and pulling and removing flowering plants in the spring (late April or early May), and plants should be bagged up and removed from the site as flowers can still form viable seed even after the plants are pulled. An alternative is herbicide treatment of the green plants between October 15 and April 1, while native species are dormant. A prescribed burn in spring following the first warm weather (temperatures exceeding 50-55 degrees) will often wipe out that years seedling crop.

Burning

Garlic mustard that has established in woodlands with little leaf litter may not respond to prescribed fire because of lack of adequate fuel since this species is a biennial and remains green over winter (Carroll and White 1997). Brown dried plants are already dead and will not respond to management. However, green basal leaves in late fall and spring may be affected by fire, if enough fuel is available. Flame torches may be used in areas where fuel loads are inadequate. Carroll and White (1997) notes that repeated fire maintains garlic mustard populations in a reduced condition. When fire is absent, garlic mustard doubles its population every two years. Repeated burning has successfully prevented the spread of garlic mustard but did not eradicate it (Carroll and White 1997).

Chemical Control

If inadequate fuel is available for a prescribed burn, herbicide may be applied to garlic mustard. Timing for applications is important. Herbicide applications are best conducted after other plants have gone dormant (Carroll and White 1997, Hoffman and Kearns 1997). Temperature should be above 40°F for better results. Glyphosate based herbicides applied at 1% and 2% are effective. Glyphosate has little effect on dominant native herbaceous species. However, it does effect *Carx jamesii* and *Carex laxiflora* (common and conservative mesic woodland sedge species, respectively), so care should be taken not to accidentally herbicide these species.

Mechanical Control

Pulling of individual plants can be conducted in areas of small infestations however, the soil should be pressed back to minimize disturbance that may benefit germination (Carroll and White 1997). Weed trimmers can be used effectively on flowering plants prior to seed production. Cutting flowering stems of garlic mustard at ground level in late May experience 99% mortality (Carroll and White 1997).

REED CANARY GRASS (*Phalaris arundinacea*)

Reed canary grass is a cool season, perennial invasive grass found in both uplands and wetlands, although it is most vigorous in wet areas. It grows 3-6 feet tall and forms dense monocultures which create foliage mats on the ground, shading and displacing native species and forming unfavorable vegetation structure for foraging and resting waterfowl and other native animals. Like many invasive species, it leafs out early in spring before many native species. It does particularly well in areas with sedimentation, fluctuating water levels, and high soil nitrogen levels.

Management of reed canary grass is difficult. Management requires more than one method of control and a minimum of three years to achieve a satisfactory reduction of this species. Control methods recommended include burning, herbicide applications, and mowing. The reason reed canary grass is difficult to control is based on its aggressive nature and its ability to establish a large seed bank. Some land managers have resorted to removing the plants and the first 6" of top soil. We do not recommend this for this site because of the high cost.

There are two windows of opportunity for control – in fall and in late May/early June. The fall treatment is most suited to areas were it is mixed with native species. In the later part of September or in October, before a hard freeze, it continues to grow and is vulnerable to a treatment with 2-6% glyphosate (Roundup or Rodeo). The second treatment time is the optimum treatment time as stated on the Roundup or Rodeo label, which is just before (boot) or during (head) flowering stage of the reed canary grass. Due to the time of application in early June, when many native species are in full growth, this method is most suited for use on single species stands of reed canary grass. Again, a 2-6

percent solution should be used

Burning

In our experience, mid to late spring burns are recommended to kill emerging green stems. These burns are often very smoky and coordination with the local fire protection district is necessary to prevent burn shut downs. Burning early in the spring will clear the standing dead vegetation and stimulate native species, but they will still compete with the re-emerging and germinating reed canary grass. Tu et.al. (2001) states that growing season fires may help reduce vigor and help control the spread of reed canary grass, while possibly giving native species a competitive advantage.

Chemical Control

We recommend herbicide applications with Rodeo to reed canary grass approximately two weeks after a burn. In the early stages of regrowth it may be easy to mistake other grass species for reed canary grass therefore herbicide should only be applied to areas that have little or no plant diversity so as to reduce the chances of killing native vegetation. To reduce non-target species damage, stands of reed canary grass can be marked with metal poles to identify the area after a burn so the herbicide application will target only invasive species. Selective herbiciding using a glyphosphate based herbicide (such as Aquaneat or Rodeo) in the late summer and fall will kill reed canary grass as it attempts to seed or prior to yellowing. Aquaneat is most effective on mature plants in wetland areas however, herbicide applications can also be made on young plants (Carroll and White 1997) Poast, a grass specific herbicide can be used on reed canary grass, however, only in upland situations or when wetland areas are sufficiently dry. Poast cannot be used in areas where groundwater is at or near the surface. Poast is effective in controlling grasses.

Mechanical Control

Certain areas of reed canary grass can be mowed at heights ranging from 8-12" in late May. In our experience this grass does not re-grow to its former height again until the following year. This prevents seed production and allows other late summer species to grow. This method does not kill the species but controls re-seeding until an herbicide application can be made.

Integrated Management

The combined use of fire and herbicide applications and supplemental seeding with aggressive native species will reduce stands of reed canary grass as long as the management is consistent. However, it is unlikely that management will eradicate this species; instead management is intended to control the species so that native species can re-establish. Management must be long term otherwise this invasive grass will re-invade previously managed areas (Carroll and White 1997). Another control method that has been successful is a combination of burning and herbicide applications. Dormant burning of reed canary grass,